Users' Technology Interpretation and Reception – Beyond Designer Intentions

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ABSTRACT
The objective of various methods and techniques in HCI is to make designs as clear as possible, and to maximize the overlap between the designers' intentions and the users' interpretations. Diverging user interpretations are seen as symptomatic of a lack of clarity between designer, system and user, and are therefore a central problem in HCI that needs to be solved. However, the proliferation of technology use in daily life puts this ideal of maximized overlap under increasing pressure. As technology is becoming more ubiquitous, more diverse target user groups and contexts of use make interaction broader and more personal. Acknowledging this increased variation in user interpretation, we are developing an evaluation method to identify and analyze variation and shifts in end user interpretation, helping designers to take into account the reality of diverse user interpretations, instead of imposing only one authoritative interpretation.

Author Keywords
Interpretation, evaluation, semiotics

CONTEXT AND MOTIVATION
Interpretation is central to human-computer interaction. At several levels, users perceive and interpret computer systems during interaction. At a low level, users interpret icons, buttons and other controls to make sense of the functionality offered by an application. On a higher level, users can interpret systems in terms of what they can mean and contribute in daily life. However, while interpretation has always been important in HCI, it has not always been foregrounded as such: often, diverging interpretations are considered a problem that needs to be solved [12]. A lack of clarity between designer, system and user is thought of as problematic: the objective of various methods and techniques in HCI is to iron out as much vagueness as possible, and to maximize the overlap between the designers' intentions and the users' interpretation [1]. To reach this goal, designers attempt to convey their design intentions to the users as accurately and as clearly as possible.

DPPI'13, September 3 – 5, 2013, Newcastle upon Tyne, UK.

In their interaction with technology, however, users often interpret and use systems in other ways than they were intended, not necessarily causing the system to break down, or fail at its tasks. On a low level of interaction, users invent their own workarounds, disregarding the intended functionality. On a higher level, users reinterpret systems with regards to what a system means in daily life, inventing new applications and meanings for systems [12]. User interpretation is not a matter of mere passive reception: through their use, users actively construct and impose new meanings on the artifacts they use.

Many evaluation strategies in HCI aim at maximizing the overlap between the design intentions and the users' interpretation: as such, they set out to compare users' interactions with the designers' intentions of how the technology should be used. These strategies, however, leave a wealth of different user interpretations underexplored. In this PhD project, we set out to explore these user interpretations in their own right, and investigate to what extent user interpretation is influenced by the applications or system structure itself, or by external factors. Ultimately, this leads to a more nuanced view of the emergent relationships between systems and their users, replacing the design intention as the norm for interaction with a multitude of more dynamic, personal and context-dependent interpretations emerging from interaction.

RESEARCH QUESTIONS
The main questions addressed in this PhD research are:

- How can differences and shifts in end users' system interpretations be identified and analyzed in a systematic analysis of technology reception?
- How can insight in these interpretive processes help designers in designing systems, taking into account the reality of different user interpretations, instead of imposing one authoritative interpretation?

BACKGROUND AND RELATED WORK
Already since the 1980s, ethnographic approaches have been used in HCI to capture users' perspectives and interpretations [13]. However, ethnography has been used primarily in early design stages (e.g. contextual inquiry), but less so in evaluation (although extensive ethnographic evaluation studies like [9] have been described in literature). In recent years, however, the interest of HCI in different 'readings' and interpretations of products and

interaction designs has spread beyond ethnographic approaches. Under the umbrella term of 'interaction criticism', various critical approaches to HCI have been practiced to analyze interaction, aiming at e.g. exposing the consequences of design, and informing or innovating the design process [1].

Originating in the 1980s and 1990s, Semiotic Engineering is a structured, semiotic theory of HCI in which differences in user interpretation are accounted for. Semiotic Engineering (SE) is a semiotic theory of HCI, offering a framework consisting of two stages: in the first stage, the system to be evaluated is analyzed, and in the second stage, the users' interpretations of the system are focused on. In this second stage, the framework explicitly accounts for differences in user interpretations, e.g. 'codifying' the way users do not pick up or recognize, but 'decline' affordances in the system [6]. However, while the framework focuses on user interpretation, it focuses on an *internal* semiotic analysis of how the constituent elements of a system establish a coherent meaning, and does not incorporate any *external* factors such as context of use, or any other more 'cultural' aspects of interpretation. Furthermore, the goal of the user evaluation remains consistent with the dominant evaluation strategy in HCI: it evaluates how clearly the designers have communicated their design intention, by examining whether the users' interpretations match the designer's intended message as it is communicated by the interface. The method primarily addresses meaning as it is communicated by the interface, not as it is established by users' interpretations [11].

The method presented in this paper draws upon Semiotic Engineering, in that it preserves the twofold method of analysis and evaluation. While SE is methodologically based on Umberto Eco's *A Theory of Semiotics* [7], we present a method based on ethnographic methods on the one hand, and on later work by Umberto Eco (*The Role of the Reader*) [8], social semiotics and multimodality [14] on the other.

RESEARCH GOALS AND METHODS

The evaluation method under development allows for investigation of users' interpretations, not by matching these interpretations to the designers' intentions, but by *analyzing* and *contrasting* these interpretations, providing insight into users' interpretive strategies [5]. This focus on user interpretation fits into the research agenda of interaction criticism, aiming for 'rigorous interpretive interrogations of the complex relationships between the interface [...] and the user experience' [2]. For this analysis, we use three separate research phases (see figure 1), inspired by SE's analysis and evaluation methods, and the three phases in general semiotic research as outlined by Theo Van Leeuwen [14]. We will outline the three phases of our evaluation method below.

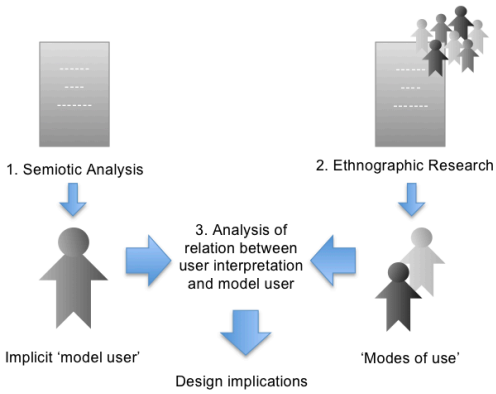

Figure 1. Semiotic research framework

In **phase one**, the system or application is submitted to a *multi-modal social semiotic analysis* [14]. This analysis focuses on the constituent parts of the system, and the way these parts collaborate to create a unified experience. In this critical expert analysis starting from the system's features, affordances and interaction, we describe how the system shapes and controls the users' experience. As such, we develop a critical understanding of how the system creates its ideal, envisioned 'model user' [5]. This model user (based on Umberto Eco's concept of the model reader [8]) is a hypothetical user that is *implicitly embedded in the system itself*. The model user uses the system in the way it was intended. As such, the model user's view of the system is just one of many possible interpretations. What sets it apart from actual users' points of view is the fact that it closely follows the interface's cues, interpreting every aspect in the most straightforward way, as imposed by the system. In the first phase of the method, we reconstruct this ideal model user through an analysis of the system.

In **phase two**, the research focuses on *actual users' interactions* with the system analyzed in phase 1. Whereas phase one concentrated on a hypothetical model user, phase two focuses on real-world interactions, and real users, investigating how users use the system, and how they interpret them from their specific point of view (personal background, context,...) [14]. Ethnographic field study techniques are used to gather qualitative data about users' interactions. In this fieldwork, the various uses and interpretations of the system result in an overview of different 'modes of use' [3] of the system.

In **phase three**, we analyze the relation between the system and the users' experience by relating the data from the multimodal semiotic analysis to the results from the ethnographic study. This will show to what extent the system structure effectively guides the users, or whether the users, through their use of the system, resist or extend the model user implied in the system structure. The ethnographic data will show how both individual and contextual factors influence user interpretation.

Finally, the three steps described above results in a detailed understanding of the role of interpretive processes in

interaction with technology. The results show which system elements are interpreted in different ways, and how various user characteristics and their context influence this variation in technology reception. This analysis, and the resulting knowledge about user interpretation, leads to a more nuanced view of the relationship between user and system, replacing the design intention as the norm for evaluation with a broader, more dynamic analysis of multiple interpretations.

The framework presented above is a comprehensive one, in that it can be applied to various systems and applications. The framework, like the SE framework, needs to address a specific research question in order to reach relevant conclusions [6]. Case studies in several domains will be used to validate the framework. The next section provides some detail on a first case study that will be finished by the Doctoral Colloquium. Other case studies will follow afterwards.

CURRENT RESULTS: EDUCATIONAL GAMES STUDY

The first case study in this PhD project focuses on *Monkey Tales*[1], an educational math game for children aged 10-11. Like all educational games, Monkey Tales faces the challenge of marrying play and education, two aspects that often are considered being generally incompatible [10]. Our study focuses specifically on this balance between 'serious' content and 'fun' gameplay. Specifically, we describe how individual players make sense of the game in various ways. The research provides a detailed account of how different players' attitudes towards math, experience with other games and other factors influence their playing of Monkey Tales, and specifically the fun-serious balance they perceive in the game. The basic assumption of the study is that players are active interpreters of educational games, and that different players can interpret a game in different ways, leading to differences in the use and effects of the game.

Following the method described above, the study consisted of three parts. The first part, the multimodal social semiotic analysis, focused on the game design, and the way math exercises are embedded in the game structure. In this analysis, we describe how the game shapes the players' experience through game play, affordances, etc. This analysis resulted in a critical understanding of how the game guides and educates its ideal model users. In general, the *Monkey Tales* analysis shows that the game separates the fun and the 'serious' learning activities to some extent. The learning activities are embedded as small arcade-style mini-games (Figure 2) that help game progression at a higher level (Figure 3): the mini-games have to be completed to go to the next level. In this relation between fun and serious, it is implied that the overall fun game progression motivates the model user to tackle the serious mini-game episodes.

[1] See www.monkeytalesgames.com.

Figure 2. Arcade-style mini-game with math exercises.

Figure 3. Overall 3D game quest in *Monkey Tales.*

The second part of the study consisted of a six-month ethnographic study. Specifically, it combined a diary study, semi-structured interviews and a long-term user experience evaluation to describe and analyze how children play the Monkey Tales game at home. This ethnographic study showed how *real* users play the game. The diary study and the interviews revealed various playing strategies: while some players voluntarily returned to the 'serious' mini-games to play more math games than strictly necessary, other players tried to maximize the gameplay, and minimize the effort needed to solve the math problems. We offer one short example. One player, who regularly played first-person shooter games, focused on the gameplay rather than the math exercises in the mini-games (see Figure 2): rather than shooting the *right answers to math problems* to earn points, one user ended up shooting *any answer* randomly, assuming (or hoping) that the right answers shot 'by accident' would earn enough points to pass the mini-game. This is but one example of 'guessing and estimating' behaviour observed during the ethnographic study.

In the third part of the study, we analyzed the relation between the game and the gamers' experience by relating the data from the multimodal semiotic analysis to the results from the ethnographic study. This analysis shows to what extent the game structure effectively guides the players, or whether the players resist or extend the model user implied in the game structure. For instance, the simple mini-game example described above shows how the user ignored the implied fun-serious dichotomy embedded in the game structure, emphasizing gameplay strategies, and all but disregarding the 'serious' learning content. While Monkey Tales' ideal model user would solve the math exercises, some *real* users do not. Comparing actual playing to the semiotic analysis, it becomes apparent that while

unintended, the game actually *allows for* this kind of behaviour through its structure and gameplay.

Ultimately, this analysis leads to a more nuanced view of the emergent relationships between serious games and its players, replacing the rigid separation between the fun and the serious with a dynamic, more personal boundary between play and education. Based on the insights from this study, it becomes an explicit choice for designers optimizing the fun-serious balance in their games to aim for a tighter integration between gameplay and exercises in the game structure, or to (consciously) allow users some freedom in their engagement with the serious content.

DISSERTATION STATUS

Before the study presented in this paper, I have performed a preliminary study with multi-touch interaction [4]. Starting from this work, the method presented above was developed. Future work will focus on testing and refining the method based on the case studies mentioned above. The thesis is aimed to be a compilation of published articles on four extensive case studies. At the time of the Colloquium, the first of these case studies will be in its final stages. Future case studies will include a study on the use of educational games in the classroom, and a study on speech interaction.

EXPECTED CONTRIBUTIONS

This dissertation research focuses on user interpretation of interactive systems. HCI will benefit from an increased understanding of the various ways users make sense of the same system, taking into account their specific backgrounds and contexts of use. These insights can be used as a basis for design, leading to new ways of designing systems that take into account the reality of diverging interpretations.

CONTRIBUTION TO THE DOCTORAL COLLOQUIUM

During the Doctoral Colloquium, I will present the theoretical framework, illustrated with the case study presented above. While this case study will be in its final stages at the time of the Colloquium, the framework is still open to refinement. I expect that expert feedback from other participants and from the Colloquium mentors will help me in polishing and refining the framework. Furthermore, I expect to engage in, and contribute to interesting discussions about the PhD projects of other participants being presented. During these discussions, other researchers can benefit from my feedback, drawing on my experience in HCI, both in academic and in industry settings.

Additionally, given my background in literary and cultural study, I could contribute a humanities-inspired point of view to the conversations. Apart from the discussions focusing on the content of the PhD works, I also expect the Doctoral Colloquium to provide an important platform for networking with other researchers, exchanging ideas, and laying the foundations for future collaborations.

RESEARCH SITUATION

With a background in literary and cultural studies, I have been pursuing a PhD on HCI and semiotics in the faculty of Social Sciences for 1,5 years. In 2015, after another two years, I expect to defend the thesis. In October 2012, I have defended my proposed topic and research plan before an internal committee; the full report of the first case study is planned to be submitted for publication in October 2013.

ACKNOWLEDGMENTS

This research is part of the Migame+ project funded by iMinds (Interdisciplinary institute for Technology), a research institute founded by the Flemish Government.

REFERENCES

[1] Bardzell, J. Interaction criticism and aesthetics. In *Proc. CHI '09*. ACM Press (2009), 2357-2366.

[2] Bardzell, J. Interaction criticism: An introduction to the practice. *Interact. Comput. 23*, 6 (2011), 604-621.

[3] Cooper, A., Reimann, R., Cronin, D. *About Face 3. The Essentials of Interaction Design*. Wiley Publishing Inc., Indianapolis, IN, USA, 2007.

[4] Derboven, J. De Roeck, D., Verstraete, M. Semiotic analysis of multi-touch interface design: The MuTable case study. *Int. J. Hum.-Comput. St.* (2012), 70 (10), 714-728.

[5] Derboven, J., Geerts, D., & De Grooff, D. (2013) Researching user interpretation beyond designer intentions. In *CHI EA 2013.* ACM Press (2013), 367-372.

[6] De Souza, C.S., Leitão, C.F. *Semiotic Engineering Methods for Scientific Research in HCI.* Morgan & Claypool, San Francisco, CA, USA, 2009.

[7] Eco, U. *A Theory of Semiotics.* Indiana University Press, Bloomington, IN, USA, 1976.

[8] Eco, U. *The Role of the Reader. Explorations in the semiotics of texts.* Indiana University Press, Bloomington, IN, USA, 1979.

[9] Gaver, W., Bowers, J., Boucher, A., Gellerson, H., Pennington, S., Schmidt, A., Steed, A., Villars, N., Walker, B. The drift table: designing for ludic engagement. In *CHI EA 2004*. ACM Press (2004), 885-900

[10] Meyer, B. and Sorensen, B.H. Designing Serious Games for Computer Assisted Language Learning – a Framework for Development and Analysis. In Kankaanranta, M. and Neittaanmäki, P. (eds.), *Design and Use of Serious Games*. Springer, 2009, 69–82.

[11] O'Neill, S. *Interactive Media: The Semiotics of Embodied Interaction*. Springer, London, UK, 2008.

[12] Sengers, P., Gaver, B. Staying open to interpretation: engaging multiple meanings in design and evaluation. In *Proc. DIS 2006*, ACM Press (2006), 99-108.

[13] Suchman, L. A. *Plans and Situated Actions: the Problem of Human-Machine Communication*. Cambridge University Press, New York, NY, USA, 1987.

[14] Van Leeuwen, T. *Introducing Social Semiotics.* Routledge: New York, NY, 2005.